

SECTION 1

GENERAL INFORMATION

1.1 INTRODUCTION

This document provides information concerning the installation and operation of the model R-1250 wide range receiver, manufactured by Dynamic Sciences Incorporated, Van Nuys, California.

The manual consists of individual sections which provide the following information:

SECTION I, General Information, describes the purpose and function of the unit, and includes equipment specifications and descriptions of options and accessories.

SECTION II, Installation, supplies the information required to unpack and install the equipment, and provides the recommended connections for power and interface cables.

SECTION III, Operation, outlines the location and function of all equipment controls and indicators. Information regarding the instrument initialization and fault indications are included in this section.

SECTION IV, Theory of Operation, provides a general explanation of circuit functions supported by signal flow diagrams for each of the major sections.

SECTION V, Service and Alignment, provides the information required to aid the service representative in fault isolation, based on flow chart procedures.

1.2 EQUIPMENT FUNCTION

The model R-1250, as shown in figure 1-1, is a solid-state radio frequency receiver that provides a means of detecting and measuring signals associated with the requirements specified for electromagnetic analysis, TEMPEST, spectrum analysis, and frequency surveillance. The receiver circuits are enclosed in a rugged compact chassis, and process RF signals in the form of a continuous wave (cw) or modulated carriers, both amplitude modulated (AM), and frequency modulated (FM), within the frequency range of 100 Hertz to 1.0 Gigahertz. Two modes of the receiver operation are incorporated into the instrument, a manual mode and a remote mode that uses computer control for tuning and function selection. The design of the model R-1250 receiver meets or exceeds the requirements as outlined in NACSIM specification 5100A.

The R-1250 uses two signal paths: one for low frequency signals from 100 Hz to 250 KHz and a second path for signals above 250 KHz. These paths are designed to optimize performance by reducing noise pick-up and eliminating the affects of ground loops.

1.3 EQUIPMENT DESCRIPTION

The model R-1250 wide range receiver consists of modularly constructed electronic circuits that are contained within a radio frequency shielded enclosure and integrated with a front panel section containing the operator controls and indicators. Input and output connections are provided by dedicated connectors located on the front and back panels of the instrument. Function control signals and interface data used by separately mounted equipment are provided through multi-contact connectors that use distinctive configurations to prevent improper positioning when mated. Two mounting configurations may be used when installing the receiver, a tilt stand bench mount or a rack mount. Physical characteristics for both configurations are listed in table 1-1. Mechanical dimensions are shown in figure 1-2.

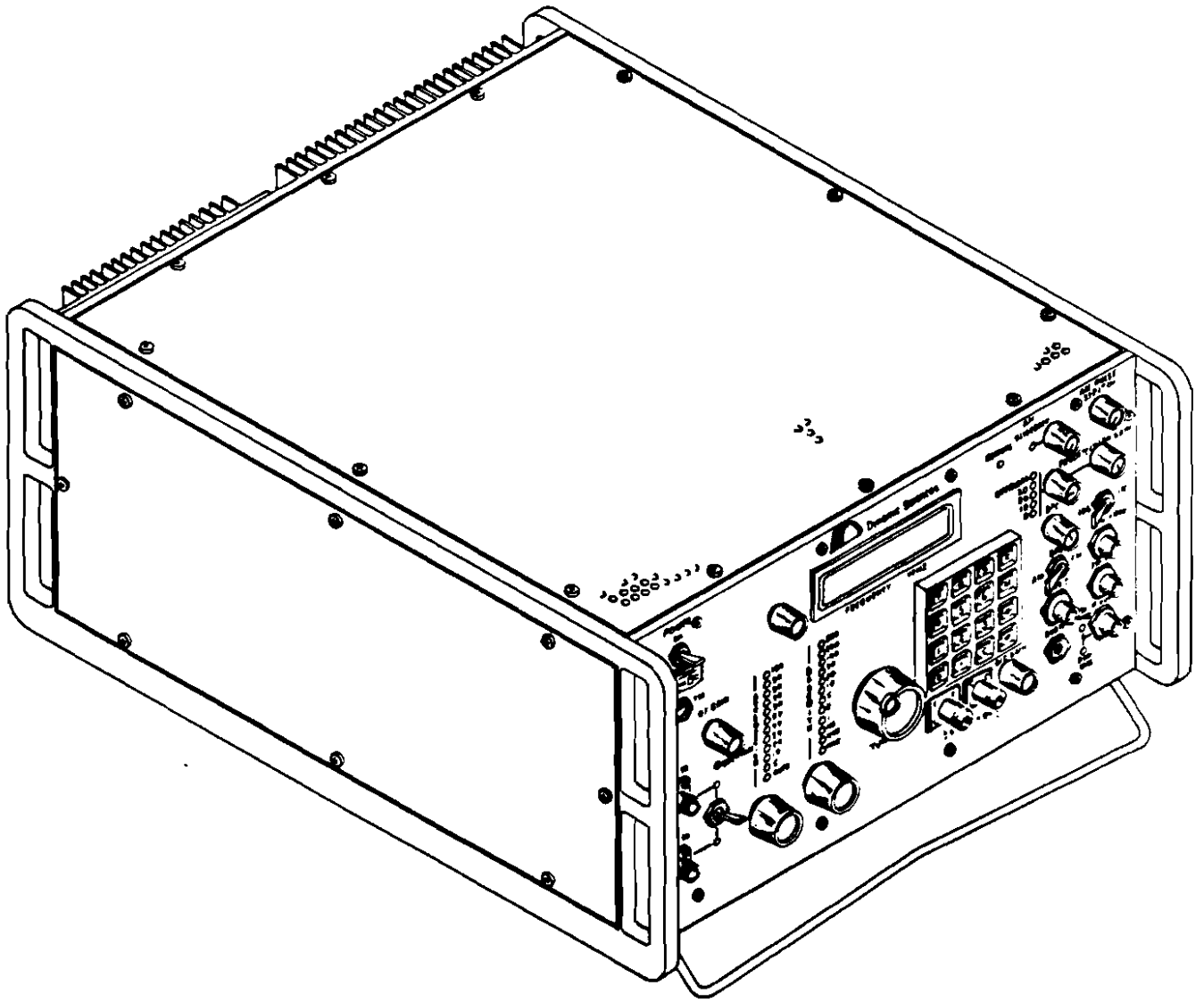


FIGURE 1-1 MODEL R-1250 WIDE RANGE RECEIVER

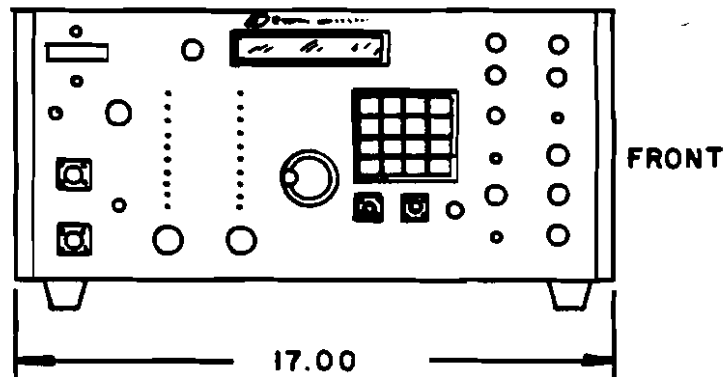
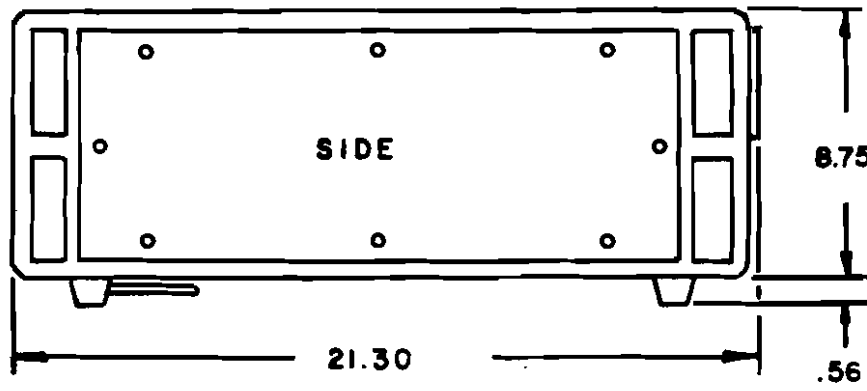
TABLE 1-1**PHYSICAL CHARACTERISTICS**

<u>CHARACTERISTIC</u>	<u>PARAMETER</u>
Dimensions	
Standard Height	8.75 in (222 mm)
Standard Width	17.0 in (432 mm)
Standard Depth	21.3 in (541 mm)
Rack Mount Height	8.75 in (222 mm)
Rack Mount Width	19.0 in (483 mm)
Rack Mount Depth	19.6 in (496 mm)
Weight (with AC Power Module)	86.0 lbs (38.7kg)
Weight (with DC power Module)	75.1 lbs (33.8kg)
TEMPERATURE	
Operating	32 to 95 F (0 to 35 C)
Storage	- 40 to 137 F (- 40 to 75 C)
RELATIVE HUMIDITY	
Operating	0 to 85% non condensing
Storage	0 to 95% non condensing

1.4 SPECIFICATIONS

Instrument specifications are listed in table 1-2. The specifications outlined are the performance standards to which the instrument is tested. If variations to specifications have been requested, a notice of engineering change and identification of the variance are included in this document.

STANDARD
MOUNT



RACK
MOUNT

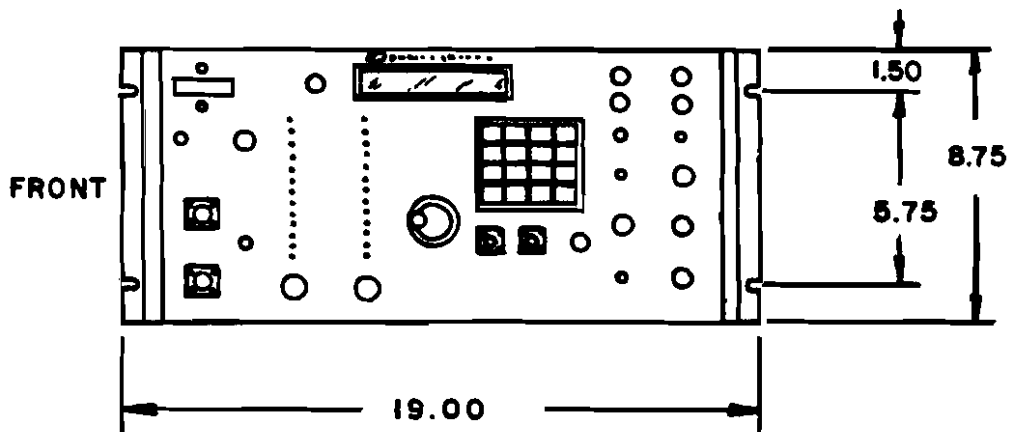
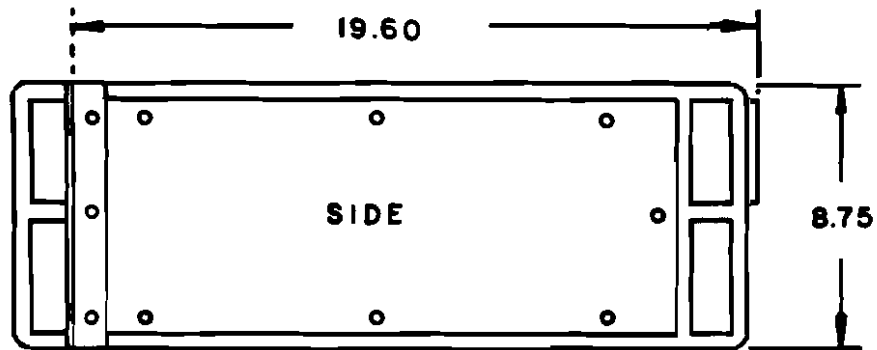


FIGURE 1-2 MECHANICAL DIMENSIONS

**TABLE 1-2
RECEIVER SPECIFICATIONS**

FREQUENCY RANGE;	100 Hz to 1 GHz
PRESELECTION:	Preselection is accomplished automatically as a function of input frequency using fixed filters.
INPUT VSWR:	2:1 maximum
NOISE FIGURE:	10 dB Nominal, 13 dB Maximum
INPUT IMPEDANCE:	50 ohms nominal at all attenuator settings
TUNING:	Single Knob Tuning with selectable tuning rate.
FREQUENCY DISPLAY:	8 digit LED, adjustable intensity
FREQUENCY RESOLUTION:	0.1 Hz below 250 kHz 1.0 Hz from 250 kHz to 20 MHz 100 Hz above 20 MHz
AUDIO DETECTOR FUNCTIONS;	BFO(CW), FM, AM
VIDEO RECEPTION MODES;	AM, FM (Available Simultaneously)
AGC MODES:	Off, Fast, Slow
SELECTABLE AM VIDEO FUNCTIONS;	Peak, Slideback, Pulse Stretch
AM VIDEO OUTPUT MODES;	Linear, Log
I-F BANDWIDTHS;	18 Bandwidths available, 50 Hz to 20 MHz in 1-2-5 sequence.
I-F SHAPE FACTOR;	Nominal 4:1 (60 to 6 dB)
I-F OUTPUT CENTER FREQUENCIES:	200 kHz and 30 MHz

TABLE 1-2
RECEIVER SPECIFICATIONS
(continued)

INPUT ATTENUATOR:

Range:	0 to 100 dB in 10 dB steps
Operation:	Manual, auto
Switching Times:	Less than 20 ms.

MAXIMUM TOLERATED RF INPUT:

CW (rms): 0.5 watt
Peak: 1000 watts, 1 μ s, 1 KHz PRF

I-F OUTPUT LEVEL;

+ 18 dBm maximum, into 50 ohms

VIDEO BANDWIDTH;

Not less than 1/2 the selected IF BW

VIDEO OUTPUT IMPEDANCE;

50 ohms

VIDEO OUTPUT LEVEL;

(Into 50 ohms)
AM: 3.0 Volts P-P
FM: 1.0 volts P-P

AUDIO BANDWIDTH;

100 Hz to 20 KHz, minimum at - 3 dB

AUDIO GAIN CONTROL RANGE:

40 dB

AUDIO OUTPUT LEVEL:

1.6 volts rms into 8 ohms or more

IMAGE REJECTION;

>90 dB

I-F REJECTION;

<250 kHz 80 dB Nominal
>250 kHz 90 dB Nominal

LO LEAKAGE AT INPUT CONNECTOR;

<250 kHz less than - 85 dBm Nominal
>250 kHz less than - 95 dBm Nominal

**INTERMODULATION RATIO FOR
TWO TONES IN RF PASSBAND:**

2nd Order: 60 dB
3rd Order <250 kHz: 60 dB
3rd Order >250 kHz: 75 dB

TABLE 1-2
RECEIVER SPECIFICATIONS
(continued)

CW DYNAMIC RANGE:	60 dB
AM DETECTOR DYNAMIC RANGE;	40 dB Nominal
FREQUENCY ACCURACY;	.1 PPM
CLOCK FREQUENCY STABILITY (Aging Rate):	.005 PPM per day
CLOCK FREQUENCY OFFSET VS TEMPERATURE;	.005 PPM 0 to 35 C
OPERATING FREQUENCY STABILITY;	After 10 minutes warm-up stability is nominally equal to clock stability.
REMOTELY CONTROLLABLE FUNCTIONS;	Frequency, IF Bandwidth, RF Attenuator, Detection mode, Predetection Gain, RF Gain, AGC Mode, SIGNAL IN/CALIBRATE IN
INPUT POWER:	AC Power Module 115/230 VAC±10% 50-60 Hz single phase, 150 watts

1.5 ANCILLARY EQUIPMENT

For system configurations, one or more of the ancillary subsystems outlined in the following paragraphs may be integrated with the model R-1250 wide range receiver. Individual items of subsystem equipment are supplied with an appropriate technical document that includes operation and installation procedures.

1.5.1 SYSTEM CONTROLLER

The model R-1160 C is a system controller that provides both manual and automatic control of interface signals to other elements of a signal acquisition and processing system. Digital communication between the system controller and a host computer is implemented with a general purpose IEEE-488 interface bus. In both manual and automatic modes, the control functions of the instrument include multiple antenna input selection and calibration signal generation from built-in impulse generators. Analog-to-digital conversion, combined with peak signal detection and variable rate sample and hold circuitry, encode the video outputs from both the RF receiver and the wide bandwidth adapter.

1.5.2 PRESELECTOR

The model R-1250-30 Preselector provides input filtering that supplements the filter stages contained within the receiver. The preselector is only active when the receiver is tuned to frequencies in the range of 250 kHz to 20 MHz, and automatically selects the appropriate filter.

1.5.3 MICROWAVE DOWNCONVERTER

The model R-1180 microwave downconverter, extends the frequency of the wide range receiver from 1.0 GHz up to 18.0 GHz. The downconverter utilizes multiple conversion techniques using digitally synthesized local oscillators to convert incoming signals into frequencies that are within the range of the receiver. The wide range receiver is slaved to the microwave downconverter to provide automatic tuning to the conversion frequency. Microprocessor circuitry within the downconverter provides control of the instrument functions and status indications.

1.5.4 NARROWBAND AUDIO PROCESSOR

The model R-1150-70 provides a means of searching a spectrum for signals, using simultaneous broadband and narrowband techniques. The audio processor contains an independent IF stage with narrowband characteristics, and an AM detector stage which drives an auxiliary audio output section. The narrowband audio processor allows the scanning of the frequency spectrum using broadband video, while simultaneously listening to narrowband audio.

1.5.5 PANORAMIC DISPLAY UNIT

The model R-1150-40 panoramic display unit provides a visual indication of the RF spectrum. A CRT displays signals up to 10 MHz on either side of the receiver's tuned frequency. Variable sweepwidth provides expansion of the display for wide bandwidth monitoring or analysis of signals using an internal crystal controlled marker generator.

1.5.6 PORTABLE ANTENNA KIT

The model R-1150-10A portable antenna kit contains a variety of antennas, designed to support electric field measurements within the frequency range of 100 Hz through 1.0 GHz in addition to magnetic field measurements from 100 Hz through 10 MHz. The antenna kit includes passive biconical and log-periodic antennas as well as active antennas which connect to a base unit containing preamplifier and filter stages.

1.5.7 WIDE BANDWIDTH ADAPTER

The model R-1250-20A is a wide bandwidth adapter, which adds 50, 100, and 200 MHz bandwidth capability to the receiver. The adapter may be controlled manually using front panel mounted controls, or automatically when interfaced with remote computer control instruments.